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A NEW SPECIES OF CAREX AND SOME NOTES ON THIS GENUS IN ARCTIC CANADA

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This paper is based upon the study of the large collections of Carex made during eight consecutive summers in eastern and western Canada by Rev. Artheme Dutilly, O.M.I., as well as those made by the junior author in 1938 at various points from Churchill, Manitoba, to Winter Island in Fox Basin and in Northern Ungava, and our joint collection in 1939 on the coasts of Labrador, Hudson Strait and the eastern coast of Hudson Bay and James Bay. We also had the advantage of studying simultaneously Theodor Holm's large collection of Canadian and arctic Carices in this Herbarium. This includes numerous sheets of Carex collected by John and James Macoun, Cox, Low, J. J. O'Neill and others of the Canadian Geological Survey who sent their Carex specimens to Holm for determination.

While collecting at Churchill the junior author gathered specimens from a colony of Carex growing several hundred yards east of the town, and a few days later discovered a similar colony west of the Churchill River. These specimens, while belonging to the Section Divisae, are not referable to any species within that section. We are therefore describing the plant as:

CAREX **Dutillyi** O'Neill and Duman, sp. nov. TAB. 669.

Rhizoma gracile, 1 mm. crassum, fuscum, squamis lineari-lanceolatis (10–20 mm. longis) imbricatis, in fibrillis dissolutis, vestitum. Culmi 3–18 cm. alti, apice 0.5–0.6 mm., basi 0.8–1.0 mm., crassi, stricti, distantes, obtusanguli, leves, foliis longiores

interdum breviores. Folia 5–10 in culmo, 2–12 cm. longa, 0.5 mm. lata, involuta, superne leviter scabriuscula; vaginae subarctae antice hyalinae; ligula brevis, 0.1 mm. alta. Spicae 2–4 (raro 1 vel 5), in capitulum subovatum vel lineari-oblongum congestae. Capitulum 5–15 mm. longum, 4–7 mm. latum; spica terminalis androgyna, floribus masculinis conspicuis, perigyniis 3–8. Spicae laterales maturae facile distinguuntur; floribus masculinis inconspicuis; perigyniis 1–6, squarrosis. Bracteae glumis similes, acutae mucronataeve. Glumae femininae late ovatae, 3.5 mm. longae, 2.5 mm. latae, apice obtusae vel acutae, castaneae, marginibus hyalinis, centris pallidis, perigyniis fere aequilongae, ea complectentes. Glumae masculinae similes attamen pallidiores angustioresque. Cladoprophyllum perigyniis simile, 3 mm. longum, 2.8 mm. latum, achenium suffultum. Antherae 1.8–2.3 mm. longae. Perigynia elliptica, 3–4.2 mm. longa, 1.5–1.8 mm. lata, subbiconvexa, fulva (pars exserta castanea), chartacea, utrinque 10–14-costata, haud alata, substipitata, basi spongiosa, in rostrum leve (0.5 mm. longum) abrupte contracta, antice fissum et emarginatum apice hyalinum. Achenia lenticularia, quadrato-ovalia, 1.8 mm. longa, 1.2 mm. lata, fulva, substipitata, subapiculata, laxe inclusa; stylus gracilis; achenio geniculatus; stigmata 2.

Rhizome slender, 1 mm. thick, brown, clothed with overlapping scales, the latter linear-lanceolate, 10–20 mm. long, more or less persisting as a fibrous coat. Culms 3–18 cm. tall, 0.5–0.6 mm. thick at apex, 0.8–1.0 mm. at base, erect, distant, obtusely angled, smooth, longer or sometimes shorter than the leaves. Leaves 5–10 on a culm, 2–12 cm. long (slightly longer in sterile tufts), 0.5 mm. wide, involute, slightly scabrellate toward the apex; sheaths rather close-fitting, hyaline ventrally; ligule a low arched ridge, 0.1 mm. high. Spikes 2–4 (rarely 1 or 5) aggregated in a solitary, irregularly ovoid to linear-oblong head, 5–12 mm. long, 4–7 mm. wide; terminal spike androgynous, the staminate portion conspicuous above the 3–8 perigynia; lateral spikes readily distinguishable at maturity, staminate portion inconspicuous, perigynia 1–6, conspicuously spreading when mature. Bracts resembling the glumes, acute to mucronate. Pistillate glumes broadly ovate, 3.5 mm. long, 2.5 mm. wide, obtuse to acute at the apex, chestnut-brown with lighter center and midrib, wide-hyaline margins, nearly as long as the perigynia and clasping them; staminate glumes similar but lighter colored and narrower. Cladoprophyllum well-developed at the base of the two lower spikes, 3 mm. long, 2.8 mm. wide, perigynium-like, usually containing a fully developed achene. Anthers 1.8–2.3 mm. long. Perigynia elliptic, 3–4.2 mm. long, 1.5–1.8 mm. wide, nearly biconvex, yellowish brown becoming chestnut brown on

exserted portion, chartaceous, 10–14 ribbed on each face, substipitate, the walls spongy-thickened at the base, slightly angled but not winged, abruptly narrowed into the smooth beak which is 0.5 mm. long, obliquely cleft and emarginate dorsally, its apex and overlapping margins of the orifice hyaline. Achenes lenticular, quadrate-oval, 1.8 mm. long, 1.2 mm. wide, yellowish-brown, short-stipitate, short-apiculate, loosely enclosed; style slender, jointed with achene; stigmas 2.

The systematic position of *C. Dutillyi* in Mackenzie's treatmeant of *Carex* in the North American Flora (**18: 32**) is in Section 7, *Divisae,* where it would appear in the key with *C. Eleocharis* Bailey. In Kükenthal's treatment of *Carex* in Das Pflanzenreich the species should be inserted under Section *Divisae* (**4[20]: 119**) where it would appear with *C. stenophylla* Wahlenb., which is the Eurasian counterpart of *C. Eleocharis.*

C. Dutillyi may be distinguished from the above species, and from *C. maritima* Gunn. by the following keys:

Leaves 5–10 to a culm; head irregularly ovoid to linear-oblong, 5–12 mm. long, 4–7 mm. thick; spikes 1–4 (5), distinguishable at maturity; cladoprophyllum perigynium-like, often containing a mature achene; perigynia biconvex, elliptic, 3–4.2 mm. long, sessile; beak smooth, entire; achenes quadrate-oval, 1.8 mm. long, 1.3 mm. wide, substipitate, loosely enveloped.....*C. Dutillyi.*

Leaves 1–4 to a culm; head ovoid to oblong, 5–20 mm. long, 5–12 mm. thick, spikes generally more than 5, not readily distinguishable; cladoprophyllum not perigynium-like, sterile; perigynium plano-convex, ovate-orbicular, 2.5–3 mm. long, substipitate; beak serrulate, bidentate; achenes orbicular-ovate, 1.7 mm. long, 1.5 mm. wide, sessile, closely enveloped.....*C. Eleocharis* (American plants).
C. stenophylla (European plants).

Culms erect, straight; spikes 1–5, distinguishable at maturity; head irregularly ovoid to linear-oblong; terminal spike with conspicuous staminate portion; bracts and glumes chestnut-brown with light center and definite midrib and hyaline margins; glumes wider than, and clasping, the perigynia; cladoprophyllum sheathing, perigynium-like and often containing a mature achene; perigynia ribbed ventrally, sessile, chartaceous, not inflated, spongy-thickened at base; achenes quadrate-oval.....*C. Dutillyi.*

Culms generally curved; spikes 4–12, nearly indistinguishable; head subglobose or short-ovoid; terminal spike with inconspicuous staminate portion; bracts and glumes thin, completely hyaline to uniformly dark chestnut throughout; glumes slightly narrower than, and not clasping, the perigynia; cladoprophyllum neither sheathing nor bearing an achene; perigynia smooth ventrally, long-stipitate, submembranaceous, slightly inflated, not spongy at base; achenes suborbicular.....*C. maritima* Gunn.

From the habitally similar *Carex Langeana* Fernald it is distinguished as follows:

Achenes maturing; cladoprophyllum perigynium-like, generally containing mature achenes; glumes castaneous with lighter center and wide hyaline margins; anthers 1.8–2.3 mm. long; leaves smooth, slightly scabrous toward the apex.....*C. Dutillyi.*
Achenes not known to mature; cladoprophyllum scarcely developed, not bearing an achene; glumes "deep-ferruginous *** with only a narrow pale border"; anthers 1 mm. long; leaves definitely spinulose-scabrous.....*C. Langeana.*

The TYPE specimen (*Duman* 1506, West of Churchill River, Aug. 8, 1938, Churchill, Manitoba) is in the Langlois Herbarium, Catholic University of America. Isotypes will be sent to the Gray Herbarium, U. S. National Herbarium, California Academy of Science, St. Vincent College, etc. COTYPE—*Duman* 1358, East of Churchill, July 30, 1938; ISOTYPE *Dutilly* 6577, West of Churchill River, Aug. 8, 1938, Churchill, Manitoba.

STATUS OF CAREX SCIRPIFORMIS MACKENZIE AND EXTENSION OF ITS RANGE.—According to Mackenzie's descriptions of *C. scirpoidea* Michx. and *C. scirpiformis* Mackenzie (N. Am. Fl. **18:** 207), they differ as follows:

Rootstock not fibrillose; glumes with very narrow hyaline margins; perigynia "short whitish pubescent", 2.5–3 mm. long, 1 mm. wide.....*C. scirpoidea.*
Rootstock fibrillose; glumes with broad white hyaline margins; perigynia "yellowish-brown or greenish-brown hirsute", 2.5–5 mm. long, 1.25 mm. wide.....*C. scirpiformis.*

A study of several hundred specimens collected on the eastern and western shores of Hudson Bay and the Islands in the Bay show that these characters cannot be used to make any definite separation of these specimens. Frequently the specimens exhibit both wide hyaline margins and very narrow hyaline margins on culms from the same tuft, sometimes even on the same spike. This characteristic of the glumes is the best possible separation proposed by Mackenzie; the other characters mentioned are still more unsatisfactory as a means of separating these plants. The form with hyaline margins appears to be most common in Manitoba, especially at Churchill, and in Alberta. On account of the very numerous freely intergrading plants we feel that it is best to treat this plant as a somewhat localized race, having a range on both sides of Hudson Bay in addition to the range given by Mackenzie. We therefore propose the new combination

CAREX SCIRPOIDEA var. **scirpiformis** (Mackenzie) O'Neill & Duman, comb. nov. (*C. scirpiformis* Mackenzie, Bull. Torr. Club **35:** 270. 1908.)

We cite the following specimens as intermediate forms

C. SCIRPOIDEA approaching the var. SCIRPIFORMIS *Duman* 1019 (Churchill), 2424 (Sugluk). *Dutilly* 6004, 6841a (Wakeham Bay). *Dutilly, O'Neill & Duman* 87726 (Port Harrison), 87568 (Sleeper Islands), 7725 (Port Manvers), 7833 (Cape Mugford).

C. SCIRPOIDEA var. SCIRPIFORMIS approaching the typical form of the species—*Duman* 1038, 1466, 1072 (Churchill). *Dutilly, O'Neill & Duman* 97142 (Cape Jones), 87267 (Wakeham Bay), 87799 (Frazier Island).

STATUS OF CAREX DRUMMONDIANA DEWEY.—Some of the more robust, southern plants of *C. rupestris Bellardi* of our collection suggested the possibility that *C. Drummondiana* might enter our area, and prompted a study of the status of that plant. It was originally described by Dewey (Am. Jr. Sc. **29:** 251 1836), and reduced to the status of a variety by Bailey, Cat. N. Am. Car. 4 1884). Mackenzie (N. Am. Fl. **18:** 220) recognizes it as a valid species with a range in the Canadian Rockies and the high mountains of central Colorado. Kükenthal (Pflanzenreich **4**[20]**: 86** 1909) places it in the synonymy of *C. rupestris* without comment.

The following table gives the characters generally used in separating these two species, for a number of specimens. (A typographical error in Mackenzie's key should be noted, viz. leaves 1–3 mm. wide, not 1.3 mm. p. 219.)

	Scales concealing perigynia	Spike mm. thick	Culm mm. thick	Leaves mm. wide
Clokey 3697 Colorado	(1)	3	0.4–0.6	1.5–2.0
Clokey 3319 Colorado	immature	3	0.6–0.8	1.5–3.0
Grøntved 198 Greenland	immature		0.6–0.8	1.5–3.0
Holm in 1886 Greenland	(2)	3	0.6–1.0	0.8–2.0
Jansen 8/7/36 Greenland	(2)	3.5	0.6–1.0	1.0–2.0
Kükenthal in 1900 Tyrol	yes	3	0.5–0.8	2
Montell in 1935 Lapland	yes	2	0.6–0.7	1.0–1.5

A study of about 80 other sheets of this species from Siberia, Scandinavia, Russia, Ural Mountains, Ellesmere Island, Hudson Bay Region, Alberta, Colorado, etc., shows that in specimens from all these localities the glumes may, or may not, conceal

the perigynia, the spike may be stout or slender, the perigynia may be separated or not, the leaf-blades may be wide or narrow. These observations lead us to accept without qualification Kükenthal's placement of *C. Drummondiana* in the synonymy of *C. rupestris Bellardi.*

The use by Kreczetowicz (Fl. U.R.S.S. **3:** 381 1935) of "Bellardi ex Allioni" calls attention to a part of Allioni's preface (Fl. Pedem. **1:** IV 1785) which evidently has often been overlooked, but which clearly bears out Kreczetowicz, namely, that Allioni "sequenti signo †" designates those species of which "alter auditor meus Cl. Ludovicus Bellardi" is the author. The following Carices are marked with the † and hence are to be credited to Bellardi: *C. rupestris*, *C. Bellardi* (incongruous as this may seem), *C. bipartita*, *C. nigra*, *C. bicolor* and *C. trigona.*

THE STATUS OF CAREX PHYSOCARPA PRESL AND CAREX MILIARIS MICHX.—Mackenzie (N. Am. Fl. **18:** 445–450 1935) in section *Vesicariae* lists three species, *C. miliaris* Michx., *C. saxatilis* L., and *C. physocarpa* Presl, as having stigmas typically two in contrast to the rest of the section having stigmas typically three. The ranges given for these three species are respectively:

C. MILIARIS, Labrador, Newfoundland, Quebec and central Maine.
C. SAXATILIS, Greenland, Labrador and Arctic Eurasia.
C. PHYSOCARPA, Pribolof Island, Upper Yukon, Mackenzie, south to the mountains of Utah and Colorado, Hudson Bay.

Most authors hold views at variance with Mackenzie's treatment; in fact, all authors consistently disagree with each other in treating this group. Thus Kükenthal (Pflanzenreich **4**[20]**:** 719, 727–728 1909), while recognizing *C. miliaris* as a species, considers *C. saxatilis* as a subspecies of *C. vesicaria* L., and *C. physocarpa* as: *C. vesicaria* L. subsp. *saxatilis* "L." Kükenthal var. *physocarpa* (Presl) Kükenthal.

L. H. Bailey (Bot. Gaz. **9:** 119–120 1884) treats *C. saxatilis* as a species of which *C. miliaris* is a variety, and in this he is followed by Fernald (RHODORA **3:** 50 1901). Later Bailey (Mem. Torr. Bot. Club **1:** 35–36 1889) accepted *C. miliaris* as a species distinct from *C. saxatilis* "with which it has no immediate affinity."

Polunin (Bot. Can. E. Arctic **1:** 135 1940) treats *C. miliaris*

as a variety of *C. saxatilis*, commenting that the latter is "a very complex and variable species which in the western parts 'runs into' phases of the next two." [evidently *C. miliaris* and *C. physocarpa*].

Hultén (Fl. Aleut. Isl. 119–120 1937), while recognizing *C. physocarpa* as a species, comments that it is closely related to *C. saxatilis*.

On one point, at least, all authors, including Drejer (Rev. Crit. 56 1841), Tuckerman (Enum. 13 1843), Lange (Fl. Dan. **48** pl. 2850 1871), Akiyama (Jr. Fac. Sc. **2**[1]**:** 226 1932), Hultén (l.c.), Ohwi (Mem. Coll. Sc. **11**[5]**:** 500 1936), Kreczetowicz (Fl. U.R.S.S. **3:** 448–449 1935), and Polunin (l.c.), [except Kükenthal (l.c. **727**)], agree; viz. that *C. saxatilis* should be treated as a species rather than a subspecies.

From an examination of nearly a thousand specimens of this group and of *C. vesicaria* we agree with the concensus of opinion that the two stigmas of this group is a sufficiently sharp distinction between it and *C. vesicaria* with its three stigmas. Drejer (l.c.), Lange (l.c.), Ostenfeld (Fl. Arct. **1:** 95 1902), and Ostenfeld and Gröntved (Fl. Iceland and Faer. **35** 1934) accept the specific rank of *C. saxatilis* [under the name of *C. pulla* Good. although Goodenough's name (1797) is antedated by *C. saxatilis* L. (1753)].

Th. Holm (Am. Jr. Sc. **10:** 271 1900) considers specimens from Kadiak, Alaska (*Walter Evans* 316 in Catholic University Herb.) as better referable to *C. physocarpa* "than to *C. compacta* R. Br. [*C. membranacea*], but neither this nor *C. physocarpa* is well understood, thus the identification is very uncertain."

C. ambusta Boott is considered a synonym of *C. physocarpa* by Kükenthal (l. c. **728**), Mackenzie (l. c. **448**) and Hultén (l. c. **119**), although Bailey (l. c. 40) treats it as a distinct species. The type specimen from Sitka, Alaska, is in the Prescott Herbarium, Oxford, and is well illustrated in Boott's "Illustrations of the Genus Carex", 1858. Boott later on, in vol. 4, refers this species to *C. salina* Wahlenb., which view is reflected in Bailey's earlier publication (*C. salina* var. *ambusta* Bailey in Carex Cat. 1884). Commenting on *C. ambusta*, Bailey (l. c.) says, "This is a good species to be separated from *C. saxatilis*, its nearest ally, by * * * perigynium nearly lanceolate, gradually

long-pointed and spreading, possessing none of that shiny, papery and inflated appearance so characteristic of most of the *Vesicariae;* scales much longer and acute or muticous; lower spike on a short but slender peduncle. Ungava Bay (Turner); British Columbia (Rothrock) to Alaska".

A reference to Boott's illustration clearly shows an ovate, short-pointed perigynium, with the lower spike on a very long peduncle. Boott's type-specimen, illustration and description correspond so closely to Presl's type-specimen and description that the view of Kükenthal, Mackenzie and Hultén seems hardly debatable. We have found it sufficiently difficult to segregate *C. physocarpa* and quite impossible to separate *C. ambusta* from *C. physocarpa.* Further, Turner's specimen from Ungava and Rothrock's from British Columbia are clearly *C. physocarpa.* Kükenthal (l. c. 728) cites Turner's specimen as *C. physocarpa.*

Mackenzie (l. c. 446) separates *C. physocarpa* from *C. saxatilis* by means of the following key:

Ligule longer than wide, or about as long as wide; basal sheaths reddened, breaking and becoming filamentose; style strongly bent downward against achene at maturity; achene broadly ovoid or obovoid.....*C. physocarpa* Presl.
Ligule very short; basal sheaths little or not at all reddened and not breaking and becoming filamentose; style flexuous; achene suborbicular.....*C. saxatilis* L.

Taking these characters in the order given, we find first of all that the wording is rather ambiguous. "Ligule longer than wide" is illustrated in Mackenzie's North American Cariceae, pl. 511, as a very short ligule about 0.3 mm. long (according to scale), while the ligule figured on pl. 512 for *C. saxatilis* is 1 mm. long. From this it is evident that Mackenzie really means that the ligule in *C. physocarpa* is long in the sense that it is high-arching, while the ligule in *C. saxatilis* is short in that it is scarcely arching. Mackenzie refers to the plate of *C. saxatilis* in Fl. Dan. (pl. 2850) as excellent, and bases his treatment on that plate. While it is true that this drawing of *C. pulla* (*C. saxatilis*) is beautifully done, the ligule is the least accurate feature of the plate. Further, European specimens of *C. saxatilis* commonly show exactly the same ligule as is figured in Mackenzie's plate 511 for *C. physocarpa;* e. g. *Baenitz* 2680 (Norway) has ligules which

are just as high-arching (long) as those figured for *C. physocarpa* (pl. 511), or as any specimen of this species from the Canadian Rockies and Alaska. The drawing for *C. saxatilis* (pl. 512) was based on a specimen from Jemtland, Sweden (*DuRietz* July 30, 1911). In the Catholic University Herbarium there is a specimen collected by Beurling and Lagerheim, Aug. 1843, also from Jemtland, which agrees in all features with pl. 512 except that the ligule is high-arching. From this it is clear that the ligule is not only worse than useless as a separating character, but extremely misleading as well.

The second character used to separate these two entities is sheaths "not at all reddened" in *C. saxatilis*. Out of 28 sheets of this species from Greenland, Iceland, Faeroes and Scandinavia in the Catholic University Herbarium, six show considerable reddening of the sheaths, while M. P. Porsild's specimen from Disco Island (July 29, 1935) is red enough to use at a bull-fight. On the other hand, out of 40 specimens of *C. physocarpa* from the Rocky Mountains and Alaska 27 are not red, although Mackenzie's key calls for "basal sheaths reddened". These specimens were all determined as such by Holm, a number of them by Mackenzie, F. J. Hermann, J. W. Stacey, etc., and all were verified by the present authors.

Equally valueless as redness of sheaths is the property of breaking into filaments, since the European specimens show it as much or, better, as little as the specimens from the Rocky Mountains and Alaska.

The last differentiating characters mentioned are "style flexuous, achene suborbicular" in *C. saxatilis*, and "style strongly bent downward against achene at maturity, achene broadly ovoid or obovoid" for *C. physocarpa*. The following table shows how useless these characters are for separating the plants in question.

C. SAXATILIS L.

	Style	*Achene*
1. *Grøntved* 280. Greenland.	Looped downward, but not appressed.	Broadly pyriform 1.5×1.4 mm.
2. *Seidenfaden* 221 Greenland.	Looped downward and appressed.	Obovate 2.1×1.7 mm.
3. *Porsild* 7/29/35 Greenland.	Conspicuously looped downward and appressed.	Broadly obovate 1.8×1.5 mm.

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4. *Dawson* 13413 Yukon (Cited by Kükenthal as *C. physocarpa* l. c. 728.)	Erect, not looped.	Broadly pyriform 2.0 × 1.5 mm.
5. *Piper* 4832. Unalaska.	Conspicuously looped and appressed.	Broadly obovate 2.0 × 1.7 mm.
6. *Cox* 647 Colorado. (Det. by Hermann.)	With two rt. angles, not looped, not appressed.	Broadly pyriform 2.0 × 1.5 mm.
7. *Howell* 1698 Alaska.	Looped and appressed.	Obovate 2.1 × 1.6 mm.

A few other differences between these two plants, as given by Mackenzie in the text, should be noted. The styles of *C. physocarpa* and *C. miliaris* are described as "blackish"; in *C. saxatilis* they are described as "whitish." As a matter of fact, the styles are equally very dark in all three plants. In the young stage the stigmas of all three plants have a white, somewhat scurfy coat, most pronounced in *C. physocarpa*, and not in *C. saxatilis*, as stated by Mackenzie. In old specimens of all three the white scurf is shed, and all are equally dark.

The width of the spikes as given by Mackenzie is 6–9 mm. for *C. saxatilis*, and 6–12 mm. for *C. physocarpa*. In all material examined in the Catholic University Herbarium the spikes of *C. saxatilis* were 4–5 mm. wide, and those of *C. physocarpa* were 6–10 mm. wide. (Kükenthal gives 6–12 mm. wide for this latter species.)

Kükenthal (l. c.) also gives certain distinguishing characters for *C. saxatilis* and *C. physocarpa* which may be summed up in the following key:

Staminate spike subsolitary, subclavate-cylindric; upper pistillate spike ovate and sessile, lower pistillate spike oblong-ovate and short-peduncled; perigynia 3–3.5 mm. long.....*C. saxatilis* L.
Staminate spikes two, cylindric; upper pistillate spike short-peduncled, erect, lower pistillate spike long-peduncled and nodding, both of them oblong-cylindric; perigynia 4 mm. long.....*C. physocarpa* Presl.

Taking these characters in the order given, out of 91 plants of *C. saxatilis* from Greenland, Iceland, Faeroes and Scandinavia the staminate spikes were solitary in 85 and twinned in 6. On the 80 plants of *C. physocarpa* from the Rocky Mountains and Alaska the staminate spikes were solitary in 54 and twinned in 26. These figures show that two staminate spikes to a culm is

more common in *C. physocarpa* than in *C. saxatilis*, but that it has little diagnostic value. Further, the tendency of the staminate spike to be subclavate is common in *C. saxatilis* and relatively rare in *C. physocarpa*, but this is likewise only a prevailing tendency, not a decisive means of distinguishing these plants.

The next character, "upper pistillate spike sessile and ovate", seems to hold in nearly all specimens of *C. saxatilis* examined, while the "lower pistillate spike short-peduncled" is shown by 95% of the specimens of *C. saxatilis* examined. On the other hand, in nearly all the specimens of *C. physocarpa* where there are two pistillate spikes, the lower is conspicuously very long-peduncled, i. e. with a peduncle 1–3 times as long as the spike, while the upper pistillate spike is very rarely sessile, but usually short- to long-peduncled. In specimens of both *C. saxatilis* and *C. physocarpa* where the pistillate spike is solitary, the peduncle may be long or short.

Measurements ot the perigynia made on specimens in the Catholic University Herbarium indicate that they should be amended to read: *C. saxatilis* 3–4 mm. long; *C. physocarpa* 4–5 mm. long, as stated by Mackenzie (l. c.).

The summing up of the differences between typical plants of these two entities results in the following key:

Pistillate spikes 4–5(6) mm. wide, the upper ovate and subsessile, the lower spike oblong, short-peduncled, rarely long-peduncled (if the spike is solitary it may be long or short); perigynium 3–4 mm. long; staminate spike subclavate-linear, rarely linear.....*C. saxatilis* L.

Pistillate spike 6–10 mm. wide, oblong, the upper short-peduncled (very rarely sessile), the lower long-peduncled, i. e. the peduncle ½ to 3 times the length of the spike (if the pistillate spike is solitary it may be either long or short); perigynium 4–5 mm. long; staminate spike linear, rarely subclavate.....*C. physocarpa* Presl.

In the preceeding discussion only plants from two separate ranges have been cited. The wealth of material recently collected by Père Dutilly and the authors in the Hudson Bay region, a region intermediate betwen the two ranges, now remains to be discussed. This material is intermediate between *C. saxatilis* and *C. physocarpa* as shown by the size of the perigynia, the width of the pistillate spikes, the length of the peduncles, the shape of the staminate spike, and the general aspect of the whole

plant. Very similar forms occur on the peaks of Colorado where they are always called *C. physocarpa*. On the other hand these plants are closely matched by material from Greenland where they are always called *C. saxatilis*. In fact, if the plants from Scandinavia, Faeroes, Iceland, Greenland, Hudson Bay Region, Rocky Mountains, Pacific Coast and Alaska are arranged in the order named, a series of insensibly intergrading forms results. A dividing line drawn anywhere in this series is just as good, or just as bad, as a line drawn anywhere else. Accordingly, we follow Kükenthal (l. c.) in treating *C. physocarpa* as a variety of *C. saxatilis* (which, however, he considered a subspecies). The earliest available name seems to be *Carex saxatilis* var. *major* Olney in S. Wats. Bot. King's Expl. 370 1871. This publication is the "U. S. Geological Exploration of the 40th Parallel; Clarence King, Geologist in Charge; Vol. V Botany, by Sereno Watson, 1871." There seems to be no indication in the original description that it is Olney's, but Watson in his "List of Plants Collected in Nevada and Utah 1867–1869" (No. 1248) which is part of the same series, and published in the same year, credits the plant to Olney.

If a dividing line must be drawn between the species and the variety, it seems best to consider the material from the Hudson Bay region as an extreme form of the var. *major*, and to restrict *C. saxatilis* to arctic and subarctic Eurasia, Iceland and Greenland.

We find that we can segregate, as such, the plants of New England and southern Canada by using the key given by Mackenzie (l. c.), but the following key enables us to separate *C. saxatilis* var. *miliaris* more surely from var. *major*.

Perigynia 2.5–3.5 mm. long, tightly investing the achene, unequally lenticular, the empty space above the achene small, less than ¼ the body of the perigynium; anthers 1.5–2.5 mm. long; leaves 1–2(3) mm. wide; staminate spike narrowly linear, 1–2 mm. wide; lower pistillate spikes sessile or short-peduncled, erect, 4–7 mm. wide; lowest bract 0.5–1.0 mm. wide.....*C. saxatilis* var. *miliaris* (Michx.) Bailey.

Perigynia 3.2–5 mm. long, more or less inflated, the empty space above the achene often ⅓ to ½ the body of the perigynium; anthers 2.5–3 mm. long; leaves 1.5–5 mm. wide; staminate spike linear to linear-subclavate, 2–4 mm. wide; lower pistillate spikes short- or long-peduncled, 6–10 mm. wide; lowest bract 1–2 mm. wide.....*C. saxatilis* var. *major* Olney.

However, in the Hudson Bay region numerous forms intergrade so closely between *C. saxatilis* var. *major* and var. *miliaris*, that we feel justified in also treating the latter as a variety, as do Fernald (RHODORA **3:** 50 1901) and Polunin (Bot. Can. E. Arct. **1:** 135 1940). In many cases, e. g. *Duman* 1413, 1392, 1238, 1307, all from Churchill, Manitoba, the plants are exactly intermediate between the two varieties.

As to the arctic distribution in North America of these two varieties, we would limit *C. saxatilis* var. *miliaris* to the subarctic area of Quebec and Labrador, and *C. saxatilis* var. *major*, while becoming more typical as it approaches Colorado and the Rocky Mountains, is found both in the eastern and western arctic and subarctic. The line separating the varieties in Quebec and Labrador is not sharp.

CATHOLIC UNIVERSITY OF AMERICA.

A MONOGRAPHIC STUDY OF ARABIS IN WESTERN NORTH AMERICA

REED C. ROLLINS

(*Continued from page 411*)

30. A. KOEHLERI Howell. Perennial; caudex much-branched, woody, covered with peg-like leaf-bases; stems slender, simple, numerous, entirely glabrous to sparsely pubescent below, 5–30 (–40) cm. high; basal leaves numerous, linear to narrowly oblanceolate, acute, entire, stellate-pubescent, 1–2 cm. long, 2–4 mm. wide; cauline leaves sessile, lanceolate, auriculate, slightly clasping, entire, glabrous or nearly so, remote to overlapping, 1–2 cm. long; sepals oblong, often purplish, sparsely pubescent, 3.5–5 mm. long, 1.5–2 mm. wide, non-saccate; petals scarlet to deep purple, nearly oblong but with a short narrow claw, 7–10 mm. long, about 3 mm. wide; glandular tissue well developed, continuous beneath all stamens; pedicels ascending to divaricate, glabrous, 1–2 cm. long; siliques divaricately spreading, arcuate, glabrous, attenuate at apex, 5–8 cm. long, about 2 mm. wide; style short or absent; seeds orbicular, narrowly winged, about 1.5 mm. broad including wing, uniseriate.

Siliques sessile, only slightly curved; cauline leaves few, remote.....30a. Var. *typica*.
Siliques shortly stipitate, strongly recurved; cauline leaves numerous, imbricated.....30b. Var. *stipitata*.